

CLAIMS

(1) A method for measuring mass from a change in oscillation frequency of a mass-measuring piezoelectric vibrating reed, the method comprising:

inputting an input signal from the piezoelectric vibrating reed to a phase comparator of a phase lock loop circuit; and

determining the oscillation frequency of the piezoelectric vibrating reed based on an output of a loop filter in the phase lock loop circuit.

(2) A measurement-signal output circuit for outputting a signal for detecting an oscillation frequency of an oscillator circuit which oscillates a mass-measuring piezoelectric vibrating reed, the measurement-signal output circuit comprising:

a voltage-controlled oscillator oscillatable at an oscillation frequency of the piezoelectric vibrating reed;

a phase detector which obtains the difference in phase between an output signal from the voltage-controlled oscillator and an output signal from the oscillator circuit; and

a loop filter having an output end connected to the voltage-controlled oscillator and an output terminal and outputting a voltage according to the difference in phase obtained by the phase detector.

(3) The measurement-signal output circuit according to claim 2, wherein the piezoelectric vibrating reed has a sensitive membrane on an exciting electrode on one surface thereof and is used for measurement in liquid.

(4) The measurement-signal output circuit according to claim 2, wherein the piezoelectric vibrating reed has a sensitive membrane on an exciting

electrode on at least one of two surfaces thereof and is used for measurement in air.

(5) A measuring apparatus comprising the measurement-signal output circuit according to one of claims 2 to 4.